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Correction to Our Article "Topology of Random 2-Complexes" Published in DCG 47 (2012), pp. 117–149

D. Cohen[1] · A. Costa[2] · M. Farber[2] · T. Kappeler[3]

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Theorem 27 from our article [1] states that any closed triangulated surface S is balanced, i.e. $\mu(X) \geq \mu(S)$ for any subcomplex $X \subset S$. Here the notation $\mu(Y)$ stands for the ratio v/f where v and f are the numbers of vertices and faces (i.e. 2-simplexes) in a 2-complex Y correspondingly.

We noticed that the arguments of the proof of Theorem 27 are valid only under an additional assumption that $\chi(S) \geq 0$. The assumption $\chi(S) \geq 0$ is implicitly used in the sentence *"Since $f \geq f'$ the above inequality follows from $2 - 2b_1(S') + e_0 \geq 4 - 4g$"* on page 134. Thus, Theorem 27 from [1] should read:

Any closed connected triangulated surface S with $\chi(S) \geq 0$ is balanced.

On the contrary, *any closed triangulated surface S with negative Euler characteristic, $\chi(S) < 0$, admits a subdivision which is unbalanced.* Indeed, let S be a triangulated

Editor in Charge: Herbert Edelsbrunner

D. Cohen
cohen@math.lsu.edu

A. Costa
armindocosta@gmail.com

M. Farber
m.farber@qmul.ac.uk

T. Kappeler
thomas.kappeler@math.uzh.ch

1 Department of Mathematics, Louisiana State University, Baton Rouge, LA 70803, USA

2 School of Mathematical Sciences, Queen Mary University of London, London E1 4NS, UK

3 Mathematical Institute, University of Zurich, Winterthurerstrasse 190, 8057 Zurich, Switzerland

closed surface with $\chi(S) < 0$ and let X be obtained from S by removing the interior of a single 2-simplex σ. Then

$$v(X) = v(S) = f(S)/2 + \chi(S), \quad f(X) = f(S) - 1$$

implying that

$$\mu(S) < \mu(X) < 1/2, \tag{1}$$

since $\chi(S) < -1/2$. Let S' be obtained from S by subdividing the simplex σ and introducing k new interior vertices in the interior of σ. Then

$$v(S') = v(S) + k, \quad f(S') = f(X) + 2k + 1 = f(S) + 2k.$$

Therefore,

$$\mu(S') = \frac{v(S) + k}{f(S) + 2k}$$

is approaching $1/2$ for $k \to \infty$. Thus we may find k large enough so that $\mu(S') > \mu(X)$, in view of (1). This shows that S' is unbalanced since X is a subcomplex of S'.

This correction affects only statement 5 of Corollary 28 from [1] which should be reformulated as follows:

If $p \gg n^{-1/2+\varepsilon}$ for some $\varepsilon > 0$ then, given a topological type of a closed surface, there exists $f_0 = f_0(\varepsilon)$ such that any **balanced** *triangulation of the surface having more than f_0 2-simplexes will be simplicially embeddable into a random 2-complex Y, a.a.s. In particular, if $p \gg n^{-1/2+\varepsilon}$, a random 2-complex Y contains small closed orientable and nonorientable surfaces of all topological types, a.a.s.*

Reference

1. Cohen, D., Costa, A., Farber, M., Kappeler, T.: Topology of random 2-complexes. Discrete Comput. Geom. **47**, 117–149 (2012)